

SIT004-P05

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X-ray absorption spectroscopy of iron-bearing minerals under high pressure.

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The Earth's mantle contain significant amount of iron. Iron in the mantle is observed to undergo high-spin to low-spin transition and change of valence state in the lower mantle condition, which affect seismic velocity and oxidation state of mantle minerals. Experimental evidences of the spin transition have been suggested from a small change of compression property or disappearance of satellite peak in X-ray emission spectrum. Change of the valence state has been observed by electron or Mossbauer microscopy for the recovered samples. These method is not conventional and take much time for measuring. Therefore, we have been challenging with another experimental method, X-ray absorption spectroscopy (XAS). This method can be combined easily with diamond anvil cell (DAC) for in situ measurement at high pressures. The X-ray absorption experiments under high pressure were performed at the BL-3A in KEK-PF (Tsukuba, Japan). The beam line is suitable for XAS with DAC because high intensity monochromatic X-ray of around 7keV from insertion device was focused with collimator and exposed to tiny area of the sample. The absorption of the samples were measured by transmission geometry with two ionization chambers. Several samples such as iron oxides, olivine and garnet were used as standard material to check the absorption edge to 20-30 GPa. We compressed also (Mg_{0.87}Fe_{0.13})O sample to 74 GPa for detect a spin transition. We found that the balance state is distinguishable even at pressures under the right conditions. The details of experiments and analysis will be presented.

Keywords: X-ray absorption, diamond anvil cell, mantle